ELSEVIER

Journal of Computational and Applied Mathematics 135 (2001) 303–311

JOURNAL OF COMPUTATIONAL AND APPLIED MATHEMATICS

www.elsevier.com/locate/cam

A boundary integral method for the three-dimensional heat equation subject to specification of energy

W.T. Ang[a,*,1], A.B. Gumel[b]

[a] *Computational and Mathematical Sciences Group, Faculty of Information Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Malaysia*

[b] *Department of Mathematics, University of Manitoba, Winnipeg, MB, Canada R3T2N2*

Received 27 January 2000

Abstract

A boundary integral method is proposed for the numerical solution of the three-dimensional heat equation subject to specification of energy. A specific test problem is solved using the method.

Keywords: Boundary integral method; Three-dimensional heat equation; Laplace transform; Non-local condition

1. Introduction

Consider solving the three-dimensional heat equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = \frac{\partial u}{\partial t} \tag{1}$$

for the unknown function $u(x, y, z, t)$ (the temperature) for $(x, y, z) \in V$ and $t \geqslant 0$, subject to the initial and boundary conditions

$$u(x, y, z, 0) = f(x, y, z) \quad \text{for } (x, y, z) \in V, \tag{2}$$

$$u(x, y, z, t) = g(x, y, z, t) \quad \text{for } (x, y, z) \in S_1 \text{ and } t \geqslant 0, \tag{3}$$

* Corresponding address. Faculty of Information Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Malaysia. Tel.: +60-82-671000; fax: +60-82-672301.

E-mail addresses: wtang@mailhost.fit.unimas.my (W.T. Ang), gumelab@cc.umanitoba.ca (A.B. Gumel).

[1] http://www.unimas.my/fit/wtang/

0377-0427/01/$ - see front matter
PII: S0377-0427(00)00589-6